

Varun Madabushi

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EDUCATION

Georgia Institute of Technology

B.S. in Electrical Engineering, Minor in Robotics

M.S. in Electrical and Computer Engineering

Ph.D. in Robotics (Advisor: Dr. Maegan Tucker)

Atlanta, GA

Aug 2017 – Dec 2020

Jan 2021 – May 2022

Aug 2024 – May 2028 (Expected)

EXPERIENCE

Dynamic Mobility Lab

Graduate Researcher

Atlanta, GA

Aug 2024 – Present

- Developed bipedal robot control system utilizing offline trajectory optimization and reinforcement learning to generate stepping behaviors that are natural-looking, easily tunable, and train faster than comparable approaches (Submitted to ICRA 2026; in review)
- Researching integration of reachability analysis tools into trajectory optimization pipeline to produce controllers for bipedal robots which are provably robust to terrain variation and external disturbances

Johns Hopkins University Applied Physics Laboratory

Robotics Engineer

Laurel, MD

Jun 2022 – Jul 2024

- Led statistical verification and operational analysis, and assisted in development of Nonlinear Model Predictive Control (NMPC) algorithm for multi-agent fixed-wing Unmanned Aerial Vehicle (UAV) systems
- Provided hardware and software support for numerous outdoor flight tests of NMPC-based UAV landing controller
- Implemented trajectory optimization to realize manipulation behaviors such as grasping and valve turning on unmanned underwater mobile manipulator (awarded top prize in internal R&D across all of the company)
- Co-led short-term research on robot co-design, which leveraged bayesian optimization to automatically choose task-optimal hardware and control parameters for hexapod robot system
- Mentored high school interns on mechanical and software design of robotic manipulator

Intelligent Vision and Automation Lab

Graduate Researcher

Atlanta, GA

Jan 2022 – Aug 2022

- Combined model predictive and reinforcement learning-based elements in heirarchial aircraft controller to improve generalization to various aircraft types
- Developed trajectory library in MATLAB utilizing convex optimization to generate composite bezier spline paths

Lawrence Livermore National Laboratory

Defense Technologies Engineering Intern

Livermore, CA

May 2020 – Aug 2020, Sep 2021 – Apr 2022

- Designed simulator and hardware-in-the-loop testing for Unmanned Surface Vehicle (USV) control system
- Developed actuator and hydrodynamic drag models fit from experimental data, used to inform new USV design
- Led development of data collection system integrating cameras, hydrophones, and FPGA on custom PCB

PUBLICATIONS

- [1] V. Madabushi, Y. Kopel, A. Polevoy, and J. Moore, “Dense fixed-wing swarming using receding-horizon nmppc,” in *2025 IEEE (ICRA)*, 2025.
- [2] R. Kim, V. Madabushi, E. Dong, and A. Mazumdar, “Increasing mobile robot efficiency and versatility through manipulation-driven adaptation,” *Journal of Mechanisms and Robotics*, vol. 13, no. 5,

SKILLS

Concepts: Nonlinear Systems, Optimal Control, System Identification, Reinforcement Learning, Parallel Programming

Programming: C++, Python, MATLAB, CUDA, ROS, Docker, STM32, Arduino, Git

Software: MuJoCo, Solidworks, OnShape, Altium, KiCAD

Tools: Soldering (SMD and THT), Mill, Lathe, 3D Printer, Oscilloscope, Logic Analyzer